#15

64 Column BASIC for the TS2068

Published Vol III:1

by Wes Brzozowski
337 Janice St.
Endicott, NY 13760

An Overview

The 64 column utilities in the TS2068 technical manual do work, but they seem to be intended for use with other machine code, and are ~~fairly~~ NOT EASY ~~complicated~~ to use from BASIC. There are far too many things to remember, ~~far too many new rules to learn~~, and debugging your programs is a nightmare. It would be much nicer if we could use regular BASIC PRINT commands. ~~Although~~ Rewriting changing the ROM would be a bit extreme, but there's ~~fortunately~~ another way.

It's possible to "intercept" certain BASIC commands before the computer executes them, and then have it run our own software, instead. This is particularly true of PRINT statements and attribute controls, like FLASH, BRIGHT, INK, and PAPER. (These are handled as though they were in a PRINT statement, anyway.) This code allows standard BASIC commands to control 64 column utilities. As such, BASIC programs can run in the 64 column mode. Because this package contains some heavily rewritten portions of the standard screen commands, which makes considerable use of code in the ROM, the TS2068 must have a TIMEX ROM installed. Those who've installed Spectrum ROM's on the main board will have to change ROMS to run this.

Unfortunately, not all BASIC commands can be intercepted

by the method we've used here. Because of this, some BASIC screen commands aren't very effective in this mode. Other things, like attribute controls, have almost no meaning in the 64 column mode. These have been "redefined" to do useful 64 column things. Since the TS2068 wasn't designed to do this, there are some limitations we have to accept. However, these limitations are fairly reasonable, and still allow a "beginner at BASIC" to sit down and immediately begin writing 64 column programs.

Start by LOADing the 64 column utilities with LOAD"". You'll be given the option to NEW the BASIC program or get a demonstration. Normally, you'll NEW the BASIC, leaving the utilities above RAMTOP, until you call for them. On your first time through, get the demonstration, to see what the program can do.

The Rules

This code has been written so that the programmer may use it with only the knowlege of BASIC that he or she already has. Nevertheless, there are some new rules, which we'll go over now.

1. When you're starting out, make the first line of your program to be RANDOMIZE USR 60000. This will turn the 64 column mode on. When the program stops, or an error occurs, you'll automatically be returned to the 32 column mode. Switching modes during the program will be covered under Advanced Concepts, but you needn't be bothered with this, now.
2. PRINT works exactly as it did before. AT and TAB may be included, but now you can use all 64 columns in them, i.e, PRINT AT 10,56;"DEMO". Commas in PRINT

statements are corrected to give you access to four print zones, instead of the two available in the 32 column mode.

3. OVER and INVERSE also work as before, and may be imbedded in PRINT statements.
4. User defined graphics are still supported, but you may want to rewrite some of your favorite ones; they look quite different as narrow characters.
5. Only BASIC commands that PRINT character information can be intercepted by this program. Commands that set individual pixels, like DRAW and CIRCLE will produce weird effects.
6. Commands that operate on the whole screen, like CLS and COPY can't be intercepted either. Certain other BASIC commands have been rewritten to perform these functions in the 64 column mode.
7. The hardware in the TS2068 limits the screen attributes in the 64 column mode. FLASH and BRIGHT aren't used at all, and the entire screen must have the same INK and PAPER combination. Furthermore, only 8 such combinations are allowed, as hinted at on pages 247 & 248 of the TS2068 manual. Because some of these commands aren't normally used here, we have redefined them as follows:
   - INK - now selects both the INK and PAPER colors, for the entire screen. Use it as you would normally, and the corresponding PAPER color will be set automatically. It should be set <u>inside</u> a PRINT command, ie, PRINT INK 7.
   - PAPER - no longer needed to select the paper color;

that's done with INK, now. Now, either PAPER 1 or PAPER Ø will cause the screen to be copied to the TS2040 printer. PAPER should be used alone; not imbedded in a PRINT command.

- FLASH - This isn't used in the 64 column mode. Now, FLASH Ø or FLASH 1 will do a 64 column clear-screen. FLASH should be used alone, not imbedded in a PRINT command.
- BRIGHT - This can't be used in the 64 column mode either. Now, BRIGHT 1 causes the characters to be printed so that vertical lines are fatter, making them more prominent on the screen. BRIGHT Ø returns printing to normal. In many cases, those using a monitor will use BRIGHT Ø, and those with a T.V. set will use BRIGHT 1, which goes a long way toward giving a better quality picture. It should be noted that the BRIGHT mode is not initialized when the program starts up or the screen is cleared. Also, if the 64 Column BASIC machine code is SAVEd, the BRIGHT mode will be SAVEd with it. This was done intentionally, to allow users to "customize" the code, according to the clarity of the pictures in their individual systems. After this is done, they need never set or change it again.

Note that in redefining these commands, they have been set up so that you can use certain "memory tricks" to remember what they do. INK sends colors, as always.

With PAPER, think of the screen image being put on a piece of PAPER. For FLASH, think of the quick flash that occurs when the screen is cleared. Now, BRIGHT makes some characters stand out from the others. It still does, but in a different way. Wether or not the characters appear any BRIGHTer, depends on the screen colors.

8. Scrolling is particularly troublesome to implement in the 64 column mode, and is not supported here. Filling up the screen will give an "OUT OF SCREEN" error, similar to what we had in the TS1000.
9. You will notice that the "edit line" (usually the bottom two lines of the screen) only gets characters in every other column. This is because the edit line still operates in the 32 column mode. The trick by which we "fool" the TS2068 BASIC interpereter into using all 64 columns doesn't work reliably in the edit line, so it's not used at all.
10. It would be best not to use ON ERROR unless you're familiar with the information in Advanced Concepts.

The best way to get started is to enter and RUN the following program. Line 1000 keeps the 64 column screen up until you press a key. By adding new lines to this program, you'll quickly become comfortable with this new extention to BASIC.

```
10 RANDOMIZE USR 60000
20 PRINT AT 10,10;"This is an example of 64 column printing!!"
1000 PAUSE 4e4
```

Advanced Concepts

This program works by modifying the computer's I/O channels in RAM, particularly channel 2, for the screen. Channel 1, for the edit line, is not modified. This change to channel 2 causes all PRINT commands (equivalent to PRINT #2), to be diverted to the 64 column utilities. Unfortunately, certain actions can cause the computer to change these channel specifications, causing general chaos on the screen. Channel 2 is not modified when the BASIC program is running, which allows the program to work reliably, as long as the BASIC program remains running

When the BASIC program ends, either normally, or due to an error, the 64 column mode is switched off. This is done by modifying the machine stack so that another switching utility is run before the error message is displayed. This infringes on the "territory" of the ON ERROR command, and so a different approach should be used, if you need ON ERROR.

The built in error set up can be bypassed by turning on the 64 columns with RANDOMIZE USR 60016. However, if the program ends, the computer will still be in the 64 column mode. If you're careful, you'll be able to LIST small programs in this mode, but things will quickly get very messy.

When ON ERROR is active, you'll have complete control over when the program will end. You should do a RANDOMIZE USR ~~60561~~ 60651 before stopping the program. This will switch the system safely back to 32 columns.

These two USR calls should also be used instead of USR 60000, if you want to switch between modes while your

program is running (it's perfectly legal to do so.) USR 60016 will turn the 64 columns on, and USR 60651 will turn them off. If the program ends accidentally in the 64 column mode, just type RANDOMIZE USR 60651 to switch it back. The following sample program will switch back and forth, each time you press a key. Don't BREAK the program unless you're in the 32 column mode.

```
10 PRINT "32 Columns"
20 PAUSE 4e4
30 RANDOMIZE USR 60016
40 FLASH 1
50 PRINT "64 Columns"
60 PAUSE 4e4
70 RANDOMIZE USR 60651
80 GOTO 10
```

The actual 64 column code is not too long (about 700 bytes). This does not mean that the space between 60700 and 65535 is vacant, however. When the wide screen is active, all the RAM resident code is moved up there, as well as the machine stack. The UDG's sit up there, too. There is better than 1.5K of empty memory available, though, which is intended for future expansion.

In Closing

Copies of this program may be SAVEd by typing in GOTO 9999, after the demonstration ends. Those who work with this program may find some previously unknown quirks; no promises are made, since the TS2068 wasn't designed for this, in the first place. Still, it opens up a fun set of new options, and I hope that others will enjoy it as I have.